I CLAIM:

1. A multilayer solid-state device for producing electrical power from light comprising:

a light energy conversion layer containing photosensitive means;

a two-sided conducting layer having the light energy conversion layer secured to a first side thereof;

a charge separation layer secured to a second side of the conducting layer;

the conducting layer providing ballistic transport of charge carriers from the light energy conversion layer to the charge separation layer.

2. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the light energy conversion layer produces photon-excited electrons which are ballistically transported by the conducting layer from the light energy conversion layer to the charge separation layer.

3. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the light energy conversion layer produces photon-excited charge carrier holes which are ballistically transported by the conducting layer from the light energy conversion layer to the charge separation layer.

4. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the conducting layer comprises an ultra-thin metal film.

5. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge separation layer comprises a semiconductor.

6. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the light energy conversion layer comprises a plurality of different photosensitive means to maximize capture of the incident light spectrum.

~~7. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the light energy conversion layer comprises a plurality of of photosensitive means structures.~~

~~8. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the photosensitive means comprising the light energy conversion layer are embedded in the conducting layer.~~

9. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the light energy conversion layer has a light receiving surface, and wherein the light receiving surface is patterned to provide increased surface area.

10. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the light energy conversion layer is porous to provide increased surface area.

11. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge separation layer is porous to provide increased surface area.

12. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge separation layer is structured to provide increased surface area.

13. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the conducting layer is formed from a metal.

14. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the conducting layer is formed from a non-metal.

15. The multi-layer solid-state device for producing electrical power from light according to claim 14 wherein the non-metal conducting layer is formed from a material selected from the group ~~including~~ conducting and semiconducting polymers.

16. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the conducting layer is formed from a metal oxide conductor.

17. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the conducting layer is substantially transparent.

18. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the conducting layer and charge separation layer define a Schottky barrier.

19. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the conducting layer and the charge separation layer define a tunnel junction.

20. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the conducting layer and the charge separation layer define a metal-insulator-metal junction.

21. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the conducting layer and the charge separation layer define a metal-insulator-semiconductor junction.

22. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge separation layer comprises a semiconductor of a predetermined type, and further including a semiconductor of the opposite type positioned between the charge separation layer and the conducting layer to provide an increased barrier height and photovoltage.

23. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge separation layer comprises an inorganic semiconductor.

24. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge separation layer comprises an organic semiconductor.

25. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge separation layer comprises an insulator deposited on a material selected from the group ~~including~~ metals and semiconductors.

26. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge separation layer comprises an insulator/semiconductor multi-layer.

27. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge separation layer is formed from template molecules to provide an increased surface area.

28. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge conducting layer is formed from template molecules to provide an increased surface area.

29. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the charge light energy conversion layer is formed from template molecules to provide an increased surface area.

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30. The multi-layer solid-state device for producing electrical power from light according to claim 1 wherein the light energy conversion layer has a light receiving surface, and wherein the light receiving surface is provided with anti-reflection coating to reduce reflective light.

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31. The multi-layer solid-state device for producing electrical power from light comprising:

a light energy conversion layer containing photosensitive means;

an ultra-thin, two sided, electrically conducting front contact layer having the light energy conversion layer secured to a first side thereof;

a two sided semiconductor charge separation layer having one side thereof secured to the second side of the front contact layer;

the front contact layer providing ballistic transport of electrical energy from the light energy conversion layer to the charge separation layer; and

an electrically conductive metal back contact secured to the second side of the charge separation layer.

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32. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the front contact layer and the semiconductor charge separation layer define a specific Schottky barrier which maximizes output power.

33. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the front contact layer and the semiconductor charge separation layer define a metal-insulator-semiconductor junction which maximizes output power.

34. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the front contact layer and the semiconductor charge separation layer define a p-type semiconductor/n-type semiconductor junction which maximizes output power.

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35 ~~36~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the metal back contact compris~~ing~~ an ohmic contact.

~~37~~ 36. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the front contact layer comprises an ultra-thin metal film layer having a thickness of between about .5 and about 1000 nm and is formed from a material selected from the group ~~including~~ consisting gold and platinum.

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~~38~~ 37. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the semiconductor charge separation layer is formed from a material selected from the group including titanium dioxide, tantalum oxide, and tungsten oxide.

~~39~~ 38. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer is formed from a material selected from the group ~~including~~ consisting merbromin, 0-phenylxanthene, and iron cyanate.

~~40~~ 39. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer is formed from a material including at least one organic dye.

~~41~~ 40. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer is formed from a material characterized by nanoclusters.

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~~42~~ 41. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer is formed from a material characterized by nanostructures.

~~43~~ 42. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer is formed from a material comprising a thin film semiconductor.

43 ~~44~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer is formed from a material including at least one metal cyanate.

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44 ~~45~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer is formed from a material including at least one metal photocyanate.

45 ~~46~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer comprises a plurality of different photosensitive means to maximize capture of the incident light spectrum.

46 ~~47~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer comprises a plurality of photosensitive means structures.

~~48~~ 47. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the photosensitive means comprising the light energy conversion layer are embedded in the conducting layer.

~~49~~ 48. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer has a light receiving surface, and wherein the light receiving surface is patterned to provide increased surface area.

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~~50~~ 49. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer is porous to provide increased surface area.

~~51~~ 50. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the conducting layer is formed from a metal.

~~52~~ 51. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the conducting layer is formed from a non-metal conductor.

~~53~~ 52. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the conducting layer is formed from a metal oxide.

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~~54~~ 53. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the conducting layer is substantially transparent.

~~55~~ 54. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the conducting layer and charge separation layer define a Schottky barrier.

55 ~~56~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the charge separation layer comprises a semiconductor of a predetermined type, and further including a semiconductor of the opposite type positioned between the charge separation layer and the conducting layer to provide an increased barrier height and photovoltage.

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56 ~~57~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the charge separation layer comprises an inorganic semiconductor.

57 ~~58~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the charge separation layer comprises an organic semiconductor.

58 ~~59~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the charge separation layer comprises an insulator formed on an organic conductor.

59 ~~60~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the charge separation layer comprises an insulator.

60 ~~61~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the charge separation layer comprises an insulator/semiconductor multi-layer.

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61 ~~62~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the charge separation layer is formed from template molecules to provide an increased surface area.

62 ~~63~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the charge conducting layer is formed from template molecules to provide an increased surface area.

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63 ~~64~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the ~~charge~~ light energy conversion layer is formed from template molecules to provide an increased surface area.

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64 ~~65~~. The multi-layer solid-state device for producing electrical power from light according to claim 31 wherein the light energy conversion layer has a light receiving surface, and wherein the light receiving surface is provided with anti-reflection coating to reduce reflective light.

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65 ~~66~~. A multi-layer solid-state device for producing electrical power from light comprising:

an ultra-thin electrically conducting film layer having first and second sides;

a light energy conversion layer mounted on the first side of the ultra-thin film layer and comprising a PS-MIM type photosynthesizer layer;

a thin layer of insulating material secured to the second side of the ultra-thin film layer and comprising opposite sides;

a two sided semiconductor charge separation layer having one side thereof secured to the side of the insulation layer opposite from the side thereof which is secured to the ultra-thin film layer; and

an ohmic-type back metal contact secured to the second side of the semiconductor charge separation layer.

66 ~~67~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein a ~~the~~ conduction band edge and the thickness of the insulation layer permit charge carriers from the light energy conversion layer to move to the back contact while preventing current flow in the opposite direction thereby maximizing output power.

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67 ~~68~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the semiconductor charge separation layer is formed from a material which functions in combination with the insulation layer and a ~~the~~ conduction band edge to allow charge carriers to move from the light energy conversion layer to the back contact while preventing current flow in the opposite direction to maximize output power.

68 ~~69~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the metal back contact compris~~ing~~es an ohmic contact.

69 ~~70~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein a ~~the~~ front contact layer comprises an ultra-thin metal film layer having a thickness of between about .5 and about 1000 nm and is formed from a material selected from the group ~~including~~ gold and platinum.

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70 ~~71~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the semiconductor charge separation layer is formed from a material selected from the group ~~including~~ titanium dioxide, tantalum oxide, and tungsten oxide.

71 ~~72~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the light energy conversion layer is formed from a material selected from the group ~~including~~ merbromin, 0-phenylxanthene, and metal cyanates.

72 ~~73~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the light energy conversion layer is formed from a material including at least one organic dye.

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73 ~~74~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the light energy conversion layer is formed from a material characterized by nanoclusters.

74 ~~75~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the light energy conversion layer is formed from a material characterized by nanostructures.

75 ~~76~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the light energy conversion layer is formed from a material comprising a thin film semiconductor.

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76 ~~77~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the light energy conversion layer comprises a plurality of different photosensitive means to maximize capture of the incident light spectrum.

77 ~~78~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the conducting layer is formed from a metal.

78 ~~79~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the conducting layer is formed from a non-metal conductor.

79 ~~80~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the conducting layer is formed from a metal oxide.

80 ~~81~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the charge separation layer comprises an inorganic semiconductor.

81 ~~82~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the charge separation layer comprises an organic semiconductor.

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82 ~~83~~. The multi-layer solid-state device for producing electrical power from light according to claim 65 ~~66~~ wherein the light energy conversion layer has a light receiving surface, and wherein the light receiving surface is provided with anti-reflection coating to reduce reflective light.

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~~84~~. A multi-layer solid-state device for producing electrical power from light comprising:

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an ultra-thin electrically conducting film layer having first and second sides;

a light energy conversion layer mounted on the first side of the ultra-thin film layer and comprising a PS-MIM type photosynthesizer layer;

a thin layer comprising a first type of semiconductor material secured to the second side of the ultra-thin film layer and comprising opposite sides;

a two sided charge separation layer comprising the opposite type of semiconductor material having one side thereof secured to the side of the thin semiconductor layer opposite from the side thereof which is secured to the ultra-thin film layer; and

an ohmic-type back metal contact secured to the second side of the charge separation layer.

~~85~~ 84. The multi-layer solid-state device for producing electrical power from light according to claim ~~84~~ 83 wherein the conduction band edge and the thickness of the thin semiconductor layer permit charge carriers from the light energy conversion layer to move to the back contact while preventing current flow in the opposite direction thereby maximizing output power.

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~~86~~ 85. The multi-layer solid-state device for producing electrical power from light according to claim ~~84~~ 83 wherein the charge separation layer is formed from a material which functions in combination with the thin semiconductor layer and the conduction band edge to allow charge carriers to move from the light energy conversion layer to the back contact while preventing current flow in the opposite direction to maximize output power.

86 ~~87~~. The multi-layer solid-state device for producing electrical power from light according to claim 84 wherein the front contact layer comprises an ultra-thin metal film layer having a thickness of between about .5 and about 1000 nm and is formed from a material selected from the group including gold and platinum.

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87 ~~88~~. The multi-layer solid-state device for producing electrical power from light according to claim 83 ~~84~~ wherein the charge separation layer is formed from a material selected from the group including titanium dioxide, tantalum oxide, and tungsten oxide.

88 ~~89~~. The multi-layer solid-state device for producing electrical power from light according to claim 83 ~~84~~ wherein the light energy conversion layer is formed from a material selected from the group including merbromin, 0-phenylxanthene, and metal cyanates.

89 ~~90~~. The multi-layer solid-state device for producing electrical power from light according to claim 83 84 wherein the light energy conversion layer is formed from a material comprising a thin film semiconductor.

90 ~~91~~. The multi-layer solid-state device for producing electrical power from light according to claim ~~84~~ 83 wherein the light energy conversion layer comprises a plurality of different photosensitive means to maximize capture of the incident light spectrum.

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91 ~~92~~. The multi-layer solid-state device for producing electrical power from light according to claim ~~84~~ 83 wherein the conducting layer is formed from a metal.

92 ~~93~~. The multi-layer solid-state device for producing electrical power from light according to claim ~~84~~ 83 wherein the conducting layer is formed from a non-metal conductor.

93 ~~94~~. The multi-layer solid-state device for producing electrical power from light according to claim 83 ~~84~~ wherein the conducting layer is formed from a metal oxide.

94 ~~95~~. The multi-layer solid-state device for producing electrical power from light according to claim 83 ~~84~~ wherein the charge separation layer comprises an inorganic semiconductor.

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95 ~~96~~. The multi-layer solid-state device for producing electrical power from light according to claim 83 ~~84~~ wherein the charge separation layer comprises an organic semiconductor.

96 ~~97~~. The multi-layer solid-state device for producing electrical power from light according to claim 83 ~~84~~ wherein the light energy conversion layer has a light receiving surface, and wherein the light receiving surface is provided with anti-reflection coating to reduce reflective light.